

CLAIMS:

1. A semiconductor processing method, comprising:
forming a conductive copper-containing material over a
semiconductive substrate;
forming a second material proximate the conductive material; and
forming a barrier layer between the conductive material and the
second material, the barrier layer comprising a compound having silicon
chemically bonded to both nitrogen and an organic material.
2. The method of claim 1 wherein conductive material consists
essentially of copper.
3. The method of claim 1 wherein the barrier layer is against
the conductive material.
4. The method of claim 1 wherein the barrier layer is against
both the conductive material and the second material.
5. The method of claim 1 wherein the second material is an
insulative material.
6. The method of claim 1 wherein the second material
comprises silicon dioxide.

1 7. The method of claim 1 wherein the organic material
2 comprises a methyl group.

3
4 8. The method of claim 1 wherein the organic material is a
5 methyl group.

6
7 9. The method of claim 1 wherein the nitrogen that is bonded
8 to the silicon is not bonded to carbon.

9
10 10. The method of claim 1 wherein the compound consists
11 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, with x being greater than 0 and no greater
12 than 4.

13
14 11. The method of claim 1 wherein the compound consists
15 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ and the barrier layer consists essentially of
16 Si_3N_y and the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, wherein x is greater than 0 and no greater
17 than 4, and wherein y is greater than 0 and no greater than about 4.

12. The method of claim 1 wherein the compound consists essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ and the barrier layer consists essentially of Si_3N_y and the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, wherein x is greater than 0 and no greater than 4, wherein y is greater than 0 and no greater than about 4, and wherein the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ is present in the barrier layer to a concentration of from greater than 0% to about 20% (mole percent).

13. The method of claim 1 wherein the compound consists essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, and wherein the forming occurs in a reaction chamber and comprises combining CH_3SiH_3 and NH_3 in the chamber to deposit the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ over the substrate, wherein x is greater than 0 and no greater than about 4.

14. The method of claim 1 wherein the compound consists essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, and wherein the forming occurs in a reaction chamber and comprises combining CH_3SiH_3 and NH_3 in the chamber with a plasma to deposit the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ over the substrate, wherein x is greater than 0 and no greater than about 4.

1 15. The method of claim 1 wherein the compound consists
2 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ and the barrier layer consists essentially of
3 Si_3N_y and the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, and wherein the forming occurs in a
4 reaction chamber and comprises combining CH_3SiH_3 , SiH_4 and NH_3 in
5 the chamber with a plasma to deposit the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ over the
6 substrate, wherein x is greater than 0 and no greater than about 4, and
7 wherein y is greater than 0 and no greater than about 4.

8
9 16. A semiconductor processing method, comprising:
10 providing a semiconductive substrate;
11 forming a first material over the semiconductive substrate;
12 forming a barrier layer proximate the first material, the barrier
13 layer comprising a compound having silicon chemically bonded to both
14 nitrogen and an organic material; and
15 forming a second material separated from the first material by the
16 barrier layer.

17
18 17. The method of claim 16 wherein the barrier layer is formed
19 against the first material.

20
21 18. The method of claim 16 wherein the barrier layer is formed
22 against the first material, and wherein the second material is formed
23 against the barrier layer.

1 19. The method of claim 16 wherein at least one of the first
2 and second materials is conductive.

3
4 20. The method of claim 16 wherein at least one of the first
5 and second materials is insulative.

6
7 21. The method of claim 16 wherein the nitrogen that is bonded
8 to the silicon is not bonded to carbon.

9
10 22. The method of claim 16 wherein the compound consists
11 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, with x being greater than 0 and no greater
12 than about 4.

13
14 23. The method of claim 16 wherein the compound consists
15 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ and the barrier layer consists essentially of
16 Si_3N_y and the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, wherein x is greater than 0 and no greater
17 than about 4, and wherein y is greater than 0 and no greater than
18 about 4.

1 24. A semiconductor processing method, comprising:
2 providing a semiconductive substrate; and
3 forming a layer over the semiconductive substrate, the layer
4 comprising a compound having silicon chemically bonded to both
5 nitrogen and an organic material.

6
7 25. The method of claim 24 wherein the organic material
8 comprises a methyl group.

9
10 26. The method of claim 24 wherein the organic material is a
11 methyl group.

12
13 27. The method of claim 24 wherein the nitrogen that is bonded
14 to the silicon is not bonded to carbon.

15
16 28. The method of claim 24 wherein the compound consists
17 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, with x being greater than 0 and no greater
18 than about 4.

19
20 29. The method of claim 24 wherein the compound consists
21 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ and the layer consists essentially of Si_3N_y
22 and the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, wherein x is greater than 0 and no greater than
23 about 4, and wherein y is greater than 0 and no greater than about 4.

1 30. The method of claim 24 wherein the compound consists
2 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ and the layer consists essentially of Si_3N_y
3 and the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, and wherein the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ is present in the
4 layer to a concentration of from greater than 0% to about 20% (mole
5 percent), wherein x is greater than 0 and no greater than about 4, and
6 wherein y is greater than 0 and no greater than about 4.

7
8 31. The method of claim 24 wherein the compound consists
9 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, wherein x is greater than 0 and no greater
10 than about 4, and wherein the forming occurs in a reaction chamber
11 and comprises combining CH_3SiH_3 and NH_3 in the chamber to deposit
12 the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ over the substrate.

13
14 32. The method of claim 24 wherein the compound consists
15 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, wherein x is greater than 0 and no greater
16 than about 4, and wherein the forming occurs in a reaction chamber
17 and comprises combining CH_3SiH_3 and NH_3 in the chamber with a
18 plasma to deposit the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ over the substrate.
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1 33. The method of claim 24 wherein the compound consists
2 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ and the layer consists essentially of Si_3N_y
3 and the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, wherein x is greater than 0 and no greater than
4 about 4, and wherein the forming occurs in a reaction chamber and
5 comprises combining CH_3SiH_3 , SiH_4 and NH_3 in the chamber with a
6 plasma to deposit the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ over the substrate.

7
8 34. A composition of matter comprising silicon chemically
9 bonded to both nitrogen and carbon, and wherein the nitrogen is not
10 bonded to carbon.

11
12 35. The composition of claim 34 wherein the carbon is part of
13 a hydrocarbon.

14
15 36. A composition of matter comprising silicon chemically
16 bonded to both nitrogen and an organic material, and wherein the
17 nitrogen is not bonded to carbon.

18
19 37. The composition of claim 36 wherein the silicon is bonded
20 to a carbon of the organic material.

21
22 38. The composition of claim 36 wherein the organic material
23 comprises a methyl group.

1 39. The composition of claim 36 wherein the organic material
2 is a methyl group.

3
4 40. The composition of claim 36 wherein the organic material
5 is a hydrocarbon.

6
7 41. The composition of claim 36 wherein the silicon, nitrogen
8 and organic material together comprise $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, with x being
9 greater than 0 and no greater than about 4.

10
11 42. A semiconductor device, comprising:
12 a semiconductive substrate; and
13 a layer over the semiconductive substrate, the layer comprising a
14 compound having silicon chemically bonded to both nitrogen and an
15 organic material.

16
17 43. The device of claim 42 wherein the nitrogen is not bonded
18 to carbon.

19
20 44. The device of claim 42 wherein the organic material
21 comprises a methyl group.

1 45. The device of claim 42 wherein the organic material is a
2 methyl group.

3
4 46. The device of claim 42 wherein the organic material is a
5 hydrocarbon.

6
7 47. The device of claim 42 wherein the compound consists
8 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, with x being greater than 0 and no greater
9 than about 4.

10
11 48. The device of claim 42 wherein the compound consists
12 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ and the layer consists essentially of Si_3N_y
13 and the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, wherein x is greater than 0 and no greater than
14 about 4, and wherein y is greater than 0 and no greater than about 4.

15
16 49. The device of claim 42 wherein the compound consists
17 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ and the layer consists essentially of Si_3N_y
18 and the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, wherein the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ is present in the layer
19 to a concentration of from greater than 0% to about 50% (mole
20 percent), wherein x is greater than 0 and no greater than about 4, and
21 wherein y is no greater than about 4.

1 50. A semiconductor device, comprising:
2 a semiconductive substrate;
3 a first material over the semiconductive substrate;
4 a second material proximate the first material; and
5 a barrier layer separating the second material from the first
6 material, the barrier layer comprising a compound having silicon
7 chemically bonded to both nitrogen and an organic material.

8
9 51. The device of claim 50 wherein at least one of the first and
10 second materials is conductive.

11
12 52. The device of claim 50 wherein the nitrogen is not bonded
13 to carbon.

14
15 53. The device of claim 50 wherein at least one of the first and
16 second materials is insulative.

17
18 54. The device of claim 50 wherein the compound consists
19 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, with x being greater than 0 and no greater
20 than about 4.

1 55. The device of claim 50 wherein the compound consists
2 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ and the barrier layer consists essentially of
3 Si_3N_y and the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, wherein x is greater than 0 and no greater
4 than about 4, and wherein y is no greater than about 4.

5
6 56. A semiconductor device, comprising:
7 a semiconductive substrate;
8 a conductive copper-containing material over the semiconductive
9 substrate;
10 a second material proximate the conductive material; and
11 a barrier layer between the conductive material and the second
12 material, the barrier layer comprising a compound having silicon
13 chemically bonded to both nitrogen and an organic material.

14
15 57. The device of claim 56 wherein the barrier layer is against
16 the conductive material.

17
18 58. The device of claim 56 wherein the nitrogen is not bonded
19 to carbon.

20
21 59. The device of claim 56 wherein the barrier layer is against
22 both the conductive material and the second material.
23

1 60. The device of claim 56 wherein the second material is an
2 insulative material.

3
4 61. The device of claim 56 wherein the second material
5 comprises silicon dioxide.

6
7 62. The device of claim 56 wherein the organic material
8 comprises a methyl group.

9
10 63. The device of claim 56 wherein the organic material is a
11 methyl group.

12
13 64. The device of claim 56 wherein the compound consists
14 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, with x being greater than 0 and no greater
15 than about 4.

16
17 65. The device of claim 56 wherein the compound consists
18 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ and the barrier layer consists essentially of
19 Si_3N_y and the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, wherein x is greater than 0 and no greater
20 than about 4, and wherein y is no greater than about 4.

1 66. The device of claim 56 wherein the compound consists
2 essentially of $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ and the barrier layer consists essentially of
3 Si_3N_y and the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$, wherein the $(\text{CH}_3)_x\text{Si}_3\text{N}_{(4-x)}$ is present in
4 the layer to a concentration of from greater than 0% to about 50%
5 (mole percent), wherein x is greater than 0 and no greater than
6 about 4, and wherein y is no greater than about 4.